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25 August 1981

CHINA REPORT SCIENCE AND TECHNOLOGY

No. 120

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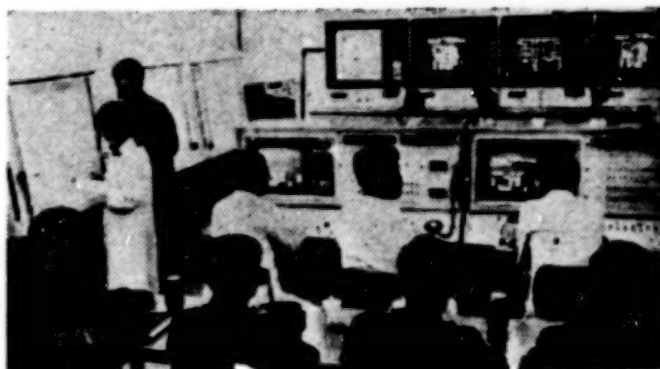
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APPLIED SCIENCES

MODERN MISSILE, SATELLITE TRACKING STATION OPENS

Tianjin TIANJIN RIBAO in Chinese 30 Jul 81 p 4

[Text] The National Defense Scientific and Technological Commission has constructed a complete and modern ground tracking and control system in order to develop China's most advanced scientific undertakings. This system would ensure the successful completion of scientific testing of guided missiles, satellites and rockets in space.



The dispatch office of the newly built central command post.

CSO: 4008/449

INORGANIC SYNTHESIS APPLIED IN DEVELOPING OPTICAL FIBER MATERIALS

Shanghai ZIRAN ZAZHI [JOURNAL OF NATURAL SCIENCES] in Chinese No 4 1981 pp 264-266

[Article by Yuan Zihua [5913 0796 5478], Zhang Keli [1728 0344 4539], Wang Jianhe [3769 1969 0149] of Wuhan University: Application of Inorganic Synthesis in the Development of Optical Fiber Materials]

[Text] Laser fiber optics communication is a new communications technology. Its characteristic is that it can use wide frequency bands and it has a large communications capacity. A thin optical cable can carry 1 million conversations and is significant in establishing multipurpose television networks for scientific and technological exchange, communication of information, color television, photo transmission, telegraph and telephone. And as computing technology and automatic control technology and automatic control technology progress rapidly, it will provide a reliable means to the exchange and transmission of massive amounts of information and data. Optical fibers are made of fine glass fibers that are as thin as silk. They differ from ordinary electrical cables. They do not use copper, aluminum, lead and such ferrous metals, they are not affected by interference from electromagnetic fields, they do not fear dampness and corrosion, they are light, they have good security characteristics and they have special meaning to the military. Over 10 years, each nation has competed in the development and progress has been fast. Fiber optics has already developed to become a modern and advanced means of communication.

The study and application of optical fiber in communications are closely related to the progress of low loss optical materials. Optical materials of the past had a high loss property. Up to 1967, the most transparent and superior optical glass still had an optical loss of 100 decibels/kilometer. This means the energy of light passing through an optical fiber of 1000 meters long will dissipate to only 10^{-100} . Such a high loss makes it difficult for transmission even over a distance of 10 meters. Therefore, at the time, people believed that relying on fiber optics for communication was almost hopeless. In autumn of 1970, Corning Glass and Bell Laboratories of the United States consecutively used chemical purification to eliminate impurities with the largest optical absorption and synthesized pure silicon dioxide glass and obtained fibers with a loss of 20 decibels/kilometers (1) which could be used in communications. From then on, the research in low loss fiber materials developed prosperously, the rate of optical loss in fibers dropped, thus promoting the rapid development of optical fiber and laser communications. Now

the loss in optical fibers has already dropped to below 0.5 decibel/kilometers, and optical fiber communications has approached applicability. The application of optical fiber in communications is also rapidly penetrating into the fields of civilian communications, military and scientific and technological fields.

Purity of Low Loss Fibers and Raw Materials

Obtaining low loss optical fibers is closely related to the purity of the raw materials used for the synthesis of fibers. A lot of data and research point out that the causes producing loss in optical fibers can be categorized as follows:

1 Optical loss

A Loss by scattering

Original scattering by the material is related to the composition of the material.

Scattering due to unevenness of the composition of the material is related to the techniques of chemical synthesis.

Scattering due to physical defects of the material is related to the conditions at time of manufacturing.

B Loss by absorption

Original absorption by the material is related to the composition of the material.

Absorption by impurities is related to the purity of the raw material.

In high loss fibers, besides scattering loss produced by uneven composition and structural defects of the material due to an uneven thermal field and imperfect techniques, absorption by impurities is a main cause of loss. For example, in soda-lime glass, when 4/millionth of iron and 6/10 millionth of copper are present, loss due to optical absorption will reach at least 120 decibels/kilometer. When using a type of silicon dioxide glass of a concentration of total impurities of below 1/millionth, loss due to absorption can be reduced to within the range of 10 decibels/kilometer (2).

Harmful impurities causing absorption by the material are transient metallic ions, ions of oxyhydrogen radicals and colloids. The outer atomic layer of transient metals such as iron, cobalt, nickel, vanadium, chromium, manganese all contain unsaturated d electrons. Under the action of external conditions, the outer layer of electrons easily oscillates or jumps, especially when encountering strong external coordination fields, splitting of the d energy level and the d-d jump produce absorption in the ultraviolet and visible light range. As a result, the transient elements produced different ligand structures and multivariate valence states at the time of forming the chemical compounds. In the glass, various different colors are produced (3), and differences in the absorption of light energy by some ions occur (4).

To produce a type of glass which has a sufficiently low absorption loss and which can be used for optical fibers in communications, Corning Glass and Bell Laboratories believe the total concentration of transient metallic ions must be lower than 1/millionth while the concentration of individual ions must be lower than 1/100 millionth (2,5,6).

In long distance communications, the loss in the optical fiber must be even lower, the corresponding purity of the material required is higher, and demands upon the individual elements is even higher. For example, at 1 decibel/kilometer, copper is 0.8 ppb, OH^- is 30 ppb.

For low loss fibers, the oscillatory absorption caused by the oxyhydrogen radical cannot be neglected. It has strong absorption peaks (1) at 0.72, 0.95, 1.4, 2.8 μm . For example, when the concentration of OH^- is 1 ppm, the optical loss produced will be 1.25 decibel/kilometer ($\lambda = 0.95 \mu\text{m}$).

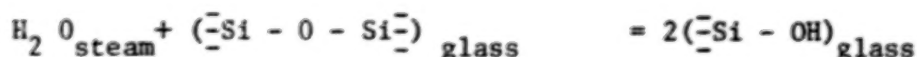
If transient metallic ions and OH^- are mixed into the material, they are very difficult to eliminate. Therefore ways must be found to remove them before synthesizing silicon dioxide glass. This first requires that the raw material must be subjected to a high degree of purification, and during the course of synthesis, impurities brought about by environmental pollution must be carefully prevented. Purification of matter requires chemical purification methods. Precise purification requires the use of various means of inorganic synthesis, such as extraction by solvents, ion exchange, distillation and redistillation, recrystallization and growing crystals, vacuum evaporation and migration by thermal diffusion, thermal decomposition and gas phase sedimentation, electrolytic refining and regional smelting. Purification of certain specific substances requires the use of a certain method of purification or a series of purification methods according to the different chemical properties and physical characteristics. Therefore obtaining highly pure raw materials is a complex and precise work. The application of inorganic synthesis techniques has stimulated continuously renewed development of semiconductor materials, and has also greatly promoted the initial development of optical fiber materials, and important means to obtain optical fibers of even lower loss was provided. The lower the loss in the optical fiber, the higher the demand upon purity. When matter reaches a highly pure state, to further lower the impurities by one magnitude presents greater difficulty, and this requires skillfully applying the methods and principles of inorganic synthesis to study, explore and seek the best method.

Application of Inorganic Synthesis in Developing Optical Fibers

The manufacturing process of optical fibers is a process of chemical reactions and sedimentation. Progress of the reactions is related to the temperature of the reaction, pressure and concentration of the reacting substances. It is also related to the properties of the reacting substances and the mechanism of the reactions. The control of these conditions directly affects the rate of production, distribution of the contents and the growth of the crystals of the material.

Natural quartz and quartz refined by the oxyhydrogen flame contain OH^- and are therefore unsuitable for manufacturing optical fibers. Now, optical fiber materials are mostly produced by plasma chemical sedimentation or chemical gas phase sedimentation in a tube. Chemical gas phase sedimentation in a tube involves the injection of SiCl_4 and O_2 into a continuously rotating quartz tube. Outside the tube, several sets of oxyhydrogen flame burners (or other high temperature heat source) which can be moved along the axial direction are used to heat the tube causing SiCl_4 and O_2 to react and produce SiO_2 , which settles onto the inner wall of the tube. After several rounds of sedimentation, a layer of SiO_2 of an appropriate thickness is obtained. Finally, the content melts and condenses into a rod shaped quartz (See Diagram 1).

To produce an optical fiber with a variable refraction gradient, during the process of sedimentation, POCl_2 (or GeCl_4 , TiCl_4) can be added which will increase the refraction. If BCl_3 (or BBr_3 , fluorides) are added, the refraction can be reduced. The method of chemical gas phase sedimentation inside a tube can avoid the effects of the atmosphere and environmental pollution, and it is even easier to obtain pure and low loss optical fiber materials. Its shortcoming is that the sedimentation rate is slow, the operation is not continuous, the yield is low. The method of using plasma chemical gas phase sedimentation outside a tube is continuous production, the yield is large, but the process is greatly affected by the environment and water vapors and low loss optical fibers cannot be easily obtained. Therefore, new manufacturing techniques for optical fiber materials must be sought to suit the needs of practical developments. The improved gas phase axial sedimentation method involves injection of SOCl_2 into the gas phase chemical reaction to eliminate the effects of the atmosphere and the effects of hydrogen compounds contained in the raw material by reducing the OH^- content in the materials. During synthesis, hydrogen compounds react with oxygen to form water vapor which spreads into the glass:



The concentration of OH^- produced is generally proportional to the square root of the atmospheric pressure of the steam. When these OH^- are excited by the laser, they produce oscillation, and absorption of corresponding wavelength occurs. To enable the OH^- to reach a sufficiently low limit, chlorosulfoxide is added during synthesis, thus obtaining the predicted results. At a high temperature, chlorosulfoxide can react with OH^- . In the silicon dioxide glass produced by sedimentation using this method, the higher content of OH^- in 1977 has already been successfully reduced to 0.3ppm in 1978 and 0.03ppm in 1979 (7).

Within the wavelengths from 0.7 μm to 1.0 μm , Fe^{2+} and Cu^{2+} respectively into Fe^{3+} and Cu^+ .



Controlling the atmosphere of O_2 and CO during sedimentation enables the equilibrium to be controlled at the lowest point of loss of optical absorption. Adding trace amounts of As_2O_3 , Sb_2O_3 can mask harmful impurities and the same results can be realized, thus avoiding repetitive purification processes (8,9).

Because of new principles in synthesis and applications, the manufacturing methods for fibers are continuously being improved, and new manufacturing methods are continually emerging. Recently, a phase separation rinsing method (10) was reported. This involves smelting GeO_2 and sodium silicoborate glass in a crucible. After injecting in oxygen, mixing and oxidation, the content is melted to become glass and pulled into rods. Finally, the rods are heated to above the softening temperature and then the rods are separated into two connected phases, i.e., the rich SiO_2 , GeO_2 phase and the ion phase. The ion phase contains most of the boron and sodium oxide. The latter can be rinsed and washed away by a type of acidic solution. This method is said to have a rapid rate of production, a large yield and a low cost. It has provided conditions for mass production.

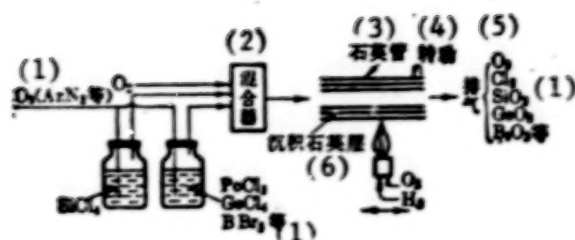


Diagram 1 Illustration of chemical gas phase sedimentation in a tube

- 1 etc.
- 2 Mixer
- 3 Quartz tube.
- 4 Rotation
- 5 Exhaust gases
- 6 Settled quartz layer

Application of Inorganic Synthesis and Development of New Types of Optical Fiber Materials

Optical materials of long wavelength and extremely low loss are the hopes in the development of long distance, large capacity and no repeater communications. They also have broad foreseeable applications in energy conversion, transmission, infrared probing of space, as well as in medicine and image and data transmission. Therefore they are being researched with emphasis abroad.

To obtain optical materials of long wavelength and low loss, the materials and the operating wavelength must be selected as follows:

- (1) The electron absorption peak of the material must fall within the shortwave zone while the oscillatory absorption within the infrared wave segment must also be very small, and the absorption peak of the oxyhydrogen radical must be avoided.
- (2) The original scattering of the material must be very small.
- (3) The incident wavelength should be selected near the intersecting point where the material absorption is zero.
- (4) The absorption by impurities and defects must be extremely small at the wavelength used. If the wavelength is chosen within the infrared zone, the effects of absorption by water and by completely oxidized transient metallic ions is very weak.

(5) The fiber material must be able to form a stable vitreous body, and the material should possess an even light conduction property.

The source of loss due to absorption by the material is the ultraviolet absorption produced by electron migration in the material and infrared absorption produced by electron oscillation. Scattering by the material is related to the incident wavelength and refraction (11). The longer the incident wavelength, the smaller the oxidation value of anions of the material, the lower the conversion temperature of the material, the more beneficial to obtaining low loss properties.

For quartz and vitreous bodies, silicon dioxide optical fibers are being studied the most at present. This is because silicon dioxide is singular in composition, the raw material is easily extracted and low loss can be easily obtained. But the melting point of silicon dioxide is high. In synthesis and pulling fibers, the heat source, container and equipment are all limited and related problems are not easily solved. Relatively speaking, the melting point of glass fiber is much lower, the types of raw materials are mixed, the amounts for purification and refining are large and the opportunities for creating pollution are increased and it is difficult to obtain low loss optical fibers. If we start out by reducing the original absorption and original scattering of glass and select elements that have a large inertia against light absorption and that have an s, p type outer electron structure such as alkali metals and alkali earth metals, stable acidic earth elements such as subgroups of silicon and germanium and subgroups of boron and aluminum, and if we select their composition and proportions appropriately so that the components of glass are not too many and the melting point is relatively low and the substance can be melted into an even solid solution, we can obtain low loss optical fiber materials. Research has pointed out that the original absorption and original scattering of certain series of glass, such as sodium-aluminum-silicon series glass are smaller than those of quartz (4).

The loss due to absorption in glass with multiple components come mainly from impurities in the raw materials. If the impurities can be correspondingly lowered using purification and refining techniques, then multiple component glass can hopefully become good optical fiber materials.

The other type of optical fiber materials -- halides -- are being widely studied. Compared to the series of quartz and glass, halide materials are completely transparent within the range of the wider infrared range. The term of the oxidation value of the anions ($Z_a = 1$) is smaller by fourfold than that of glass ($Z_a = 4$). They also have an even lower conversion temperature, therefore halide materials can have an even smaller scattering than silicon dioxide glass. Actually, the original loss due to scattering is below 1×10^{-3} decibels/kilometer in BeF_2 at $1.05 \mu\text{m}$, ZnCl_2 at 3.5 to $4.0 \mu\text{m}$, and TlBr at $8 \mu\text{m}$. The chromatic dispersion of silver halide within a very wide range of infrared waves is very small, optical loss is also very low, and within the range of these wavelengths, absorption caused by impurities of transient metals and OH^- is all very small. These characteristics have attracted people's attention to halide materials (12,13).

At present, research of new types of extremely low loss optical materials abroad include the series of halogen and alkali metal compounds, the series of compounds of halogen and thallium, silver, zinc, beryllium, as well as the series of compounds of silicon, germanium and sulfur, selenium. These compounds have a very small original

loss in the material (within the range of 10^{-1} to 10^{-5} decibels/kilometer) with a range of 2 to 10 μm . Among the three types of compounds listed above, alkali metallic halides mostly belong to ion type crystals, their polarity is large, their conversion temperature is high, and they are not easily made into even vitreous bodies, therefore they are poor in their mechanical properties and optical evenness. But germanium-silicon compounds and sulfur-selenium-tellurium compounds easily vitrify, but the Z value is large, the covalence of the bond is strong, the conversion temperature is relatively high. Only the halides of thallium, silver, zinc and beryllium can satisfy the demands of long wavelength and extremely low loss optical materials in their crystalline structure, their bonding and polarity, their Z values, their conversion temperature. Actually, thallium bromide and thallium iodide fibers of a loss of 0.01 decibel/kilometer have been produced. Zinc chloride fibers and silver bromide fibers with a loss of 0.1 decibel/kilometer and 0.2 decibel/kilometer have also been produced.

Finally, to obtain optical materials of good properties, besides paying attention to the absorption by the material and loss due to scattering, attention must also be paid to the material's own property of forming vitreous bodies well so that workable materials with even optical properties can be obtained. These properties are all related to the components and the conditions of synthesis of the materials. The structure of the SiO_2 series glass is a connected tetrahedron. The structure of the B_2O_3 , As_2S_3 series glass is a triangular arrangement. These structural types can be adjusted by the components of the alkali metallic halides to form stable vitreous structural characteristics. These still have to rely on more profound research in their chemical composition, structure and properties.

At present, research in new types of optical fiber materials is still not sufficient. Work in this regard in our nation is even less. The task of materials science is to utilize the basic theories of chemistry, physics, especially crystal chemistry, quantum chemistry and solid state physics to explore and study new types of materials. In such exploration and research, inorganic synthetic chemistry can provide important means in basic research and synthesis techniques. In the future, as optical communications technology develops, inorganic synthetic chemistry will develop greater functions in seeking new optical fiber materials and in studying new manufacturing techniques.

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CSO: 4008/394

APPLIED SCIENCES

BRIEFS

MINIATURE COMPUTER--Beijing, 18 Jun (XINHUA)--The "DJS140 miniature multi-purpose high-grade electronic computer," designed by Qinghua University and other units and trial-manufactured by the Beijing No 3 computer plant, was recently assessed by the state and deemed suitable for mass production and nationwide application. Composed of Chinese-made medium-sized and small integrated circuits, the computer can store 64-128K (1K stands for 1,000 bits of information) and perform 800,000 computations per second. It has an access time of 1.2 microseconds and 81 instructions of all kinds. Recently the State Computer Industry Bureau organized a group composed of the Beijing wired communication equipment plant, Qinghua University and eight other units to test three samples of this computer. The computers were found to have reached or surpassed the testing standard and technical requirements. [Beijing Xinhua Domestic Service in Chinese 0025 GMT 18 Jun 81]

GUANGDONG COMPUTER CENTER--The Nanhai branch of the China Petroleum Company has set up an electronic computer center using modern equipment in Guangdong's Zhanjiang Municipality. The equipment was imported from France. [Beijing Domestic Service in Mandarin 1200 GMT 28 Jul 81]

CSO: 4008/450

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Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [BIOCHEMISTRY AND BIOPHYSICS] in Chinese No 1, 1981 on back cover

- [Text] An Exploration of Biological Order.....Huang Huici
[7806 1920 1964], Biophysics Research Institute, Chinese Academy of Sciences (1)
- The Structure and Function of Chlorophyll A (Chla).....
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- Preparation of Polyinosinic Acid-Polycytidylic Acid (Poly I:C) (I), (II).....Li Nanqian [2621 2809 5409], Li Yon [2621 1635 5478] and Li Gaowo [7812 7559 3087], all of the Biophysics Research Institute, Chinese Academy of Sciences; et al. (35)
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Studies on the Mitochondrial Biogenesis of Haploid and Diploid Cells of Saccharomyces cerevisiae. I. Changes of Enzymatic Activities in Mitochondrial Inner Membrane from Glucose Repression to Derepression and the Effect of Chloramphenicol during Glucose Derepression.....Lin Zhihuan [2651 3112 3562], Li Jinzhao [2621 6855 3564] and Zhao Yunjuan [6392 0061 7710], et al., all of the Biophysics Research Institute, Chinese Academy of Sciences (50)

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- [Text] Trends in Molecular Biology.....Zou Chenglu [6760 2110 7627], Biophysics Research Institute, Chinese Academy of Sciences (1)
- Chiral Dynamics of Biomolecules.....Xu Jinghua [1776 0079 5478], Shanghai Biochemistry Research Institute and the Biophysics Research Institute, Chinese Academy of Sciences (11)
- NMR and Its Applications in Molecular Biology.....Hua Qingxin [5478 1987 2450], Biophysics Research Institute, Chinese Academy of Sciences (15)
- Reactive Oxygen and Its Biological Significance.....Mo Jian [5459 4675], Department of Chemistry, Fourth Military Medical University (23)
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Computer Science

AUTHOR: YU Shaoyong [0060 4801 1661]
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ORG: Both of North China Center of Computer Science

TITLE: "Design, Research, and Making a PROM [Programmable Read-Only Memory] Programmer"

SOURCE: Beijing DIANZI JISUANJI DONGTAI [COMPUTER REVIEW] in Chinese No 6, Jun 81 pp 17-21

ABSTRACT: With the rapid development of LSI [large-scale integrated circuit] and microprocessors, applications of PROM, EPROM semiconductors are becoming very extensive while a PROM programmer becomes a necessary tool and at the same time it is also a component of the MDS system of miniature computers. This special use programmer is simply constructed and is generally to be used to program the PROM products of the same factory. There are also general purpose programmers on the market, manufactured by companies of the USA and Japan, however. Many types of such bipolar products were applied in the design of computers of the DJS-200 series and DJS-180 series, and the MOS type EPROM. There is, therefore, an urgent need to design a group of PROM programmers suitable for mass production. Taking into consideration the properties of various foreign make programmers and the special needs of China, the authors designed a general purpose one suitable for several major Chinese PROM, and MOS type EPROM products. The system structure, the function, the programming signal source, the CRT display, etc. of the programmer are explained.

AUTHOR: PANSHEG Qing [2104 3932 3237; transliteration of Japanese name] et al

ORG: None

TITLE: "Precision Needle-Type Han Character Typewriter"

SOURCE: Beijing DIANZI JISUANJI DONGTAI [COMPUTER REVIEW] in Chinese No 6, Jun 81 pp 42-54

ABSTRACT: In order that a Han character typewriter can be suitable for use as a computer terminal, it must be of small volume, light weight, low cost, and low noise. It must also be fast, produce a good quality print, have repeat writing capability, and the capability of making drawings and tables. The paper describes the method of designing such a typewriter and the structure of its final design, including some outstanding problems. This paper is an excerpted translation from REPORT OF PRACTICAL RESEARCH [a Japanese Journal] Vol 28 No 2, 1979.

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CSO: 4009/417

AUTHOR: GUO Xiaoning [6751 2556 1337]

ORG: Wuhan Boiler Plant

TITLE: "Analysis of Design of Scraper Type Slag Remover for the 300MW Boiler in Yuanbaoshan Thermal Power Plant"

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 7, 5 Jul 81 pp 13-17

ABSTRACT: In China, most thermal power plants use inferior coals of high ash residue and slag removal becomes one of the difficult problems. The major difficulty is the fact that the slag remover wears out quickly through abrasion and the parts have to be very frequently replaced. This is true with most hammer type, double roller type slag crushers. The 300MW boiler of Yuanbaoshan Thermal Power Plant is an import from France. In its 3 years of operation, the scraper type slag remover has been operating very well, unlike the others that have to be repaired every 3 to 6 months. There were a few accidents, but analyses revealed that they are completely avoidable with careful maintenance. This paper introduces the structure of the major portion of the French-made scraper which comes with the boiler. The slag-removing capacity of the scraper, the tractive force of the chain, and the strength of the major parts are analyzed and reported. There is also a description of the major merits of this machine.

AUTHOR: ZHU Longjiu [2612 7127 3773]
NI Jiucheng [0242 0036 2052]

ORG: Both of Beijing Electric Power Designing Academy

TITLE: "Emergency Auxiliary Power Supply for Large TG Units"

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 7, 5 Jul 81 pp 37-42

ABSTRACT: The safety and reliability of the power used in a thermal power plant are extremely important. Aside from guaranteeing the power source for starting the auxiliary equipment, there must also be power to guarantee safe stopping of the power-generating equipment of the plant. The AC emergency power sources available include the inverting battery, the diesel generator, or the gas turbine generator. At present, the tendency is to use the diesel generated emergency power. The representative designs of emergency power systems at Tuhe, Yuanbaoshan, and Dagang thermal power plants are introduced. The paper also includes a formula for designing the emergency power supply for a 200MW plant.

AUTHOR: None

ORG: None

TITLE: "First Joint Meeting of North China United Electrical Power Equipment Manufacturing Company and Its Technical Advisory Committee"

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 7, 5 Jul 81 p 80

ABSTRACT: Under the guidance of the policy of developing advantageous conditions, protecting competition, and promoting cooperation of the central party and the State Council, the major electrical power equipment manufacturers of North China, on a voluntary basis, merged into the North China Electrical Power Equipment Manufacturing Joint Company in Oct 80. The constituent members of the company now include the Beijing Boiler Plant, Beijing Heavy Electrical Machinery Plant, the Tianjin Power Generating Equipment Plant, the Beijing Switch Plant, the Baoding Transformer Plant, the Beijing Low Voltage Electrical Device Plant, Tianjin Electrical Cable Plant, Tangshan High Voltage Electrical Ceramics Plant, Guilin Electrical Capacitor Plant, Guangzhou High Voltage Electrical Apparatus Plant, with 3 cooperative members of First Ministry of Machines Designing Academy, Nanjing Electrical Ceramics Plant, and the Zhengzhou Research Institute of Machines of the First Ministry of Machines Scientific Research Academy. That company will have 26,000 employees, of which 1,860 are technicians, 710 engineers. According to the 1979 data, the total production is valued at 4.3×10^8 yuan and the profit is 1×10^8 yuan. The first Technical Ad-

[continuation of DIANLI JISHU No 7, 81 p 80]

visory Committee meeting was held in Beijing on 1-4 Jun 80, and 86 members of the committee participated. Problems regarding operation decision making, types and quality of products, scientific research and service, technical cooperation, etc. were discussed. The request of the Neimenggu Bureau of Electrical Power Management for the company to take over the supply of power generating equipment, power transformers, power storage plants, phase modulation equipment, and the reconstruction of heating engineering of cities was also discussed. Contracts for technical cooperation were also signed with Beijing Steel and Iron Designing Research Academy, Ministry of Water Conservancy Beijing Surveying and Prospecting Design Academy, Henan Provincial Electric Power Science Experiment Institute, and Heilongjiang Provincial Forestry Designing Academy, etc.

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CSO: 4009/409

AUTHOR: MA Yunjie [7456 0061 2638]

ORG: None

TITLE: "Soft Printed Circuit Board"

SOURCE: Shanghai DIANZI JISHU [ELECTRONIC TECHNOLOGY] in Chinese No 6, 81 p 32

ABSTRACT: The Shanghai Radio Plant No 20 is the first to succeed in making a soft printed circuit board. It has been certified for production in batches. Internationally, the soft printed circuit board is a new technology created and applied since the 60's. This technology remained a blank in China until now, however. It is small and light and can be folded and bent without affecting its reliability; therefore, it may be extensively used in cameras, telecommunication equipment, automobile instruments, precision meters, electronic computers, etc. The technique of making it is very briefly introduced.

AUTHOR: LYU Guofu [0712 0948 1381]

ORG: Shanghai Optical Machinery Institute

TITLE: "Introducing Digital Programmed Instrument for Controlling the Temperature of Epitaxial Furnace of Semiconductors"

SOURCE: Shanghai DIANZI JISHU [ELECTRONIC TECHNOLOGY] in Chinese No 6, 81 pp 44-45

ABSTRACT: The epitaxial technique of growing multiple layer liquid phase semiconductors is currently an important means of preparing various functional parts in integrated optical research, and there is the problem of controlling the thickness of the epitaxial layer. It is known from theoretical computation that the thickness is in direct proportion to the speed of the temperature reduction. For this reason, the temperature is in need of precise control during the entire growing process, and the control involves a procedure of rising temperature-- constant temperature-- continuous reduction of temperature at a different rate of reduction. This paper introduces an instrument [made by the Shanghai Optical Machinery Institute?] designed for this purpose. It may also be used for temperature control in growing various crystals, annealing and heat treatment of crystals and glass, etc. The technical indices and the work theory of the instrument are given.

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CSO: 4009/431

Medical Experiments

AUTHOR: WANG Shu [3769 2579]
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ORG: All of Second Military University of Medicine First Hospital

TITLE: "Pathomorphology and Phosphorus Determination of Phosphorus Burns in Rabbits"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese
Vol 6 No 3, Jun 81 pp 136-138

ABSTRACT: In case of phosphorus burns, through either inhalation or the burnt surface absorption, phosphorus and its oxides may enter various organs through the blood circulation to cause pathological disorders of the nervous and cardiovascular systems and especially the liver and the kidney. For the purpose of studying these pathological changes and determining the inorganic phosphorus content of the liver and the kidney, 10 rabbits were experimentally burnt with phosphorus. Of the group, 5 died within 72 hours, 2 died in 4-7 days, and 3 were killed 28 days after burning. A group of 4 healthy rabbits was used as the control. After dissection, pathological changes of the heart, lungs, kidneys, liver, and brain were observed and recorded; 20 g of liver tissues and 10 g of kidney tissues were taken for phosphorus determination. Although qualitative tests of the tissues all indicate high positive, quantitative tests do not indicate a high content. It is perhaps necessary to perform the test immediately after death.

AUTHOR: XIAO Guangxia [5135 0342 1115]
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ORG: All of the Third Military University of Medicine First Hospital

TITLE: "Clinical Significance of Bacterial Counts in Burns"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese
Vol 6 No 3, Jun 81 139-140

ABSTRACT: Bacterial examinations are developing from qualitative to quantitative and from the surface to the deep layer tissues. In Mar-Sep 80, the authors performed bacterial culture and identification of tissue specimens below 73 burnt scars of 18 victims, suffering, on the average, from about 54.6 percent of third degree burns of the body. From the specimens, 110 bacterial strains were obtained. This paper discusses the fact that quantitative determination or bacterial counts can reflect the amount and type of pathogenetic bacteria that have invaded the deep, nonburnt tissues, and ratio of the various bacterial strains. Studies on the relationship between the bacterial count and the success or failure of skin transplant and the relationship between the bacterial count and the duration after the burn are also reported.

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ORG: All of Guangzhou Troop Military Medicine Research Institute

TITLE: "Isolation and Identification of Dengue Virus From the Fushan District of Guangdong"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese Vol 6 No 3, Jun 81 pp 141-144

ABSTRACT: In the period between Jul and Oct 78, there were more than 2,000 cases of high fever, muscular pain, joint pain, and skin rash. Dengue fever was suspected. Under the cooperation and guidance of Research Institute of Microbiology and Epidemic Diseases of the Military Academy of Medical Sciences, a project of isolation and identification of the virus was carried out. With the rat brain infection technique, 5 strains of viruses were isolated from 42 cases of acute victims clinically diagnosed to be dengue fever. The original incubation period was found to be 12-17 days; 10-14 days for the second-third generations of virus, and 9-12 days for the fourth and fifth. The pathogenicity and the incubation period began to stabilize after the third to fifth generation, and the toxicity of the virus increased with the number of generations cultured.

AUTHOR: LI Yutang [2621 5940 2768]
QIN Yizhong [4440 0001 0022]
ZHAI Yao [5049 3852]
GONG Jianzhang [7895 1696]

ORG: All of Field Study Group, Research Institute of Malaria Control and Treatment, Second Military University of Medicine

TITLE: "Treatment of Chloroquine-resistant Falciparum Malaria With Hydroxypiperaquine Phosphate"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese Vol 6 No 3, Jun 81 pp 157-159

ABSTRACT: Following reports of chloroquine-resistant falciparum malaria in Central and South America and Southeast Asia, such cases have also occurred in Hainan Island and the southern border of Yunnan Province in China. There is an urgent need of finding a new and effective drug of low toxicity. The Pharmaceutical Chemistry Research Group of the Second Military University synthesized the new antimalaria drug, hydroxypiperaquine phosphate, which was proved to be effective for pernicious malaria [= falciparum malaria] and side effects of the drug are few. In Jun-Nov 1979, 158 cases of falciparum malaria were treated in Hainan Islands with chloroquine to produce 66 cases of the chloroquine-resistant variety. The new drug was administered, and the fever receded within 96 hours in all 66. Follow-ups in 21 and 28 days disclosed 3 cases of recurrence, amounting to 9.38 percent.

6248

CSO: 4009/411

AUTHOR: ZONG Ruhou [1350 3067 0624]
YANG Meixiao [2799 5019 1366]

ORG: None

TITLE: "Signal Fluctuations Observed During the Symphonie Experiment"

SOURCE: Shanghai DIANXIN KUAIBAO [TELECOMMUNICATIONS INFORMATION] in Chinese No 4, Apr 81 pp 17-20

ABSTRACT: This paper reports the signal fluctuation phenomenon caused by low level atmospheric turbulent currents, observed at the surface station of Hongqiao, Shanghai, in 1978-79 during its participation in the Symphonie Satellite Communication Experiment. The recorded typical signal fluctuation curve and the statistical data of the worst month are given. The data are compared with the meteorological parameters of the region of Shanghai and the geographical condition of the area surrounding the surface station for an analysis of the causes of such signal fluctuations.

AUTHOR: CHEN Yunzhi [7115 0061 1807]

ORG: None

TITLE: "Multiplexing of Time Slots for Time Division Digital Switching Systems"

SOURCE: Shanghai DIANXIN KUAIBAO [TELECOMMUNICATIONS INFORMATION] in Chinese No 4, Apr 81 pp 37-41

ABSTRACT: Digital time division switching is in reality time slot switching, with time slot multiplexing its necessary preparation. This is different from the multiplexing of the PCM transmission system. This paper first discusses the relationship between multiplexing of time slots and time slot switching, with emphasis on an analysis of the multiplexing action and the concrete method of its realization. Finally, a circuit design formula is proposed, using the 1024 multiplexing of time slot device formed by intermediate and small scale integrated circuits. Actual connection and property tests have proved the design to meet the speed requirement of 8192kb/s. The circuit design is simple and the operation is stable and reliable.

6168

CSO: 4009/416

Water Conservation

AUTHOR: None

ORG: Ministry of Water Conservancy Team Touring the USA to Observe Water and Soil Conservation

TITLE: "Report of the USA Tour to Observe Water and Soil Conservation"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 1, 81 pp 22-29

ABSTRACT: In accordance with the Sino-American Agricultural Cooperation Plan of 1980, the Ministry of Water Conservancy dispatched a team of 5 persons to tour the USA to observe the water and soil conservation, irrigation and drainage, and flood and water-logging prevention practices in that country. The team arrived in Washington D. C. on 22 May 80 and stayed for one month. Following a brief report of the essential data of water and soil resources and agricultural production condition of the USA, the history of efforts, laws, and practices in the USA to control soil erosion is introduced. Engineering structures to provide irrigation and drainage are the obvious factor in promoting agricultural production, but soil salinization in the irrigated regions remains a serious problem. According to surveys of the 60's, it affects 30 percent of cultivated acreage in the country. The importance of the Mississippi in the USA is like the Changjiang and Huanghe combined in China. Problems and attempts for flood control of that river are introduced. It is said that urban

[continuation of SHUILI SHUIDIAN JISHU No 1, 81 pp 22-29]

transportation needs are taking up 6 million mu of superior farmland every year; market price of agricultural products fluctuates a great deal; new structures have to be built to replace old water conservation projects to meet the requirements of agricultural machines which are forever becoming larger in size; the State is reducing the amount of capital investment in small river valleys; some areas are not as well taken care of as others and the no-plowing technique has created some concern among the farmers. Merits and problems of water and soil conservation practices in the USA are outlined in this report.

ORG: Bureau of Planning and Designing Management, Ministry of Water Conservancy

TITLE: "Zhujiang [Pearl River] Valley Planning Cooperative Conference Held in Fushan, Guangdong Province"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 1, 81 p 57

ABSTRACT: The Zhujiang Valley Planning Cooperative Conference was called by the Zhujiang Water Conservancy Committee of the Ministry of Water Conservancy on 25-31 Oct 80 in Fushan City. Participants included more than 60 persons in charge of water conservancy, electrical power, transportation, agriculture, environmental protection, etc. of the provinces of the Zhujiang Valley and related departments of the central government. The Zhujiang Valley Project was proposed and revisions to that document were discussed. The work of the project was preliminarily formulated to be presented to the central government for further revision. The Minister of the Ministry of Water Conservancy, Qian Zhengying [6929 2973 5391] delivered the closing speech in which she emphasized the necessity of completing the project in 10 years in order to realize the 4 modernizations and in order to accomplish this it is essential that the various provinces should seek cooperation to investigate, reform, and be comprehensive and realistic. She urged everyone present to propose a comprehensive formula that is technically feasible and economically reasonable to produce the maximum overall benefit at a minimum possible cost.

AUTHOR: ZHU Hongxi [2612 3163 3556]

ORG: Water Conservancy Survey and Design Academy, Ministry of Water Conservancy and Shanxi Province

TITLE: "Preliminary Evaluation of Water Resources of Shanxi Province"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 2, 81 pp 1-8

ABSTRACT: On the basis of the population, the average stream runoff in Shanxi Province is only 500mm, amounting to 18.5 percent of the nation's average. Based upon the natural condition of the province, this paper attempts to give a unified assessment of surface and ground water resources. Following a discussion of the conditions of supplementation, runoff, and drainage, and using the equation for natural water balance, the total water resources of the province are computed. Problems with regard to the influence of evaluation of the ground water resource on the evaluation of total water resource, the deep ground water runoff, and the water loss through evaporation are discussed. Finally, a hydrological map and an isogram of water resources of the province are presented. The paper also includes, briefly, several ideas of the author concerning the solution to the problem of water deficiency of the province. Essentially, the solution depends upon artificial means of influencing the climate and upon research on transferring southern waters to the north.

AUTHOR: ZHAN Jiaxin [6124 1367 9515]

ORG: Department of Water Conservancy, Hunan Province

TITLE: "Small Hydroelectric Power Stations are the Major Energy Source of Rural Villages in Hunan"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 2, 81 pp 59-61

ABSTRACT: Hunan is a province of no petroleum and little coal. Although prospecting is being carried on, no large oil reserve has been discovered to date. Coal reserve is very limited, only about 28.5×10^8 tons, to be used up in 40-50 years at the current rate of mining. There are more than 600×10^8 tons of bone coal reserve, with a heat energy of 800-2,000 Cal/kg, and a great deal of research is needed for its utilization. Solar energy, wind energy, and nuclear energy are all still in a research stage. Marsh gas is very promising for rural villages, but in terms of energy output and simplicity of utilization, it still cannot be compared with small hydroelectric power stations. There is an urgent shortage of fuel for daily living in Hunan. At present, the people depend upon firewood and the need is 300,000 tons per year. In many places, trees and grass roots have been exhausted to leave barren mountains and serious problem of water and soil loss and the destruction of the ecological balance. This leaves the development of small hydroelectric power the major solution to the problem. The bulk of the paper is devoted to introducing the past history and the future prospect of developing small hydroelectric power in the province.

AUTHOR: MEI Zhengxing [2734 2973 2502]

ORG: Karst Scientific Research Team, Department of Geology, Guizhou College of Engineering

TITLE: "Application of Lycopodium Spores [Club Moss] in Ground Water Linkage Test in China"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 3, 81 pp 35-39

ABSTRACT: The technique of using club moss spores to trace ground water connections has been frequently reported in foreign countries. It was introduced to China in 1974 and has since been used in regions of karst development in China, such as Guangxi, Guizhou, etc. The practice of the past several years proved it to be very effective. This paper reports the special characteristics of these spores, the method of staining the spores and storing them, the technique of depositing the stained spores and of taking samples of spores, the technique and equipment for spore examination, and the technique of processing and interpreting the data.

AUTHOR: FANG Jinju [2455 6855 5418]

ORG: Dali County Water Conservancy Survey Design Team, Yunnan Province

TITLE: "Large Electric Compacting Test Instrument Successfully Made"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 3, 81 pp 61-62

ABSTRACT: The Civil Engineering Office of the team has successfully made 2 large electric compacting test instruments. The rotary compacting hammer is automated to improve the compacting function, to guarantee the precision of the test, and to reduce the labor intensity. Since the instruments were completed, it has been used for testing 7 dirt and random material engineering projects in Dali and Chuxiong counties with ideal results. The theory, the major structure, the range of application, and the major technical specifications of the instrument are introduced. The paper also includes a structural drawing and a photo of the instrument.

AUTHOR: BAI Lin [4101 2651]

ORG: Bureau of Field Water Conservancy, Ministry of Water Conservancy

TITLE: "Prospects of Small Hydroelectric Power Development in China"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 4, 81 pp 55-59

ABSTRACT: The development of small-scale hydroelectric power in China began in the early 50's. The major characteristic is the close unity of flood control and power generation, in an effort of mobilizing local and brigade capabilities to provide energy for the use of rural villages. By the end of 1979, 90,000 such power stations have been completed in the country, having a capacity of 6,300,000 kw, or 30 percent of the hydroelectric power of the nation. In Jan-Nov 80, 700,000 kw were added, with another 2,000,000 kw now under construction. Small hydroelectric power stations are economically reasonable in China, averaging 1000-1300 yuan/kw of construction cost. This is higher than the per kw cost of medium and large power stations, with all the capital investment coming from the State. With small power stations, the State provides only 1/4 to 1/3 of the construction cost. Moreover, the power is supplied to nearby users and long distance transmission lines are not needed. The paper also argues against the idea of a recent paper in NENGYUAN ZHENGCE TONGXUN (No 19, 80) that China's small hydroelectric power resources are not rich and large and medium power stations should be emphasized. Several survey data are given to support the author's viewpoint that the existing small hydroelectric power amounts to only 10 percent of China's potential.

AUTHOR: LIU Jun [0491 0193]

ORG: Changchun Machine Research Institute, Ministry of Water Conservancy

TITLE: "Prototypes of the SLQ Series Amphibian Dredges Successfully Made"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 4, 81 p 63

ABSTRACT: The SLQ series amphibian dredges are made by the Changchun Machine Research Institute of the Ministry of Water Conservancy, the Sanmenxia Hydrological Engineering Machinery Plant, and Changchun Water Conservancy Machinery Plant, based upon the special needs of the Huanghe Irrigation District of Ningxia and Neimenggu. The work of designing the machines of this series began early in 1980 and was completed in late Aug of the same year. The capacity of the bucket of the SLQ-20 and the SLQ-40 is 0.2 and 0.4 m³ respectively. They operate either in water or on land. They may be used to clean irrigation ditches, artificial waterways, lakes, ponds, and small harbors to make them deeper, etc. They may also be used to dig various drainage ditches, building foundations, etc.

AUTHOR: LI Jianshu [2621 1696 2873]

ORG: Design Academy, Guangxi Bureau of Water Conservancy and Electric Power

TITLE: "Preliminary Investigation of the Verification of Maximum Modern Flood Level and Its Application"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 6, 81 pp 24-33

ABSTRACT: The concept of modern climate is, strictly speaking, a product of the modern natural geographical condition. The meteorologists analyzed with isotopes, geology, and phenology and concluded that the present day is about ten thousand years after the conclusion of the last Quaternary glaciation. There have been 4 cooling off periods in these ten thousand years, with the 4th one around the year 1725. Using phenological techniques, China's meteorologists have produced a figure depicting the climatic changes in China during the past five thousand years. These changes basically correspond to the climatic fluctuations of the rest of the world. The idea of the maximum flood level is calculated on the basis of a cooling off period when the snow line is the lowest. Horizontal silting occurs during that period also. Phenological evidences supporting this theory and its application in the calculation and estimate of the maximum flood volume of such hydrological structure as the Jincheng Hydroelectrical Power Station are discussed.

AUTHOR: HUANG Yonglu [7806 3057 7120]

ORG: Technology Team, Work Site No 2, Bureau of Hydroelectricity No 6, Ministry of Hydroelectric Power

TITLE: "Leakage Treatment of Earth-stone Cofferdam--The Blast Pressure Method"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 6, 81 pp 62-63

ABSTRACT: The engine site of the Taipingxiao Power Station in the Northeast had to be completed before the 1977 flood season. The foundation for the cofferdam was dug and concrete was poured to a height of 160.6 m. In the middle of Mar 77, several leaks were discovered. As the quantity of water rose, vertical cracks in varying widths of 1-3 cm and subsidence phenomenon were also detected. The water changed from clear to murky and finally turned into a slurry. The foundation was completely submerged in 4 hours. The cause of the leakage was determined to be the fact that when the dam was constructed the temperature at night dropped to -10°C to cause the material to turn into frozen earth. With the arrival of spring, the temperature rose and the frozen lumps of sandy earth thawed. Two schemes of repair were taken into consideration: throwing clay onto the side of the dam facing the water or digging two vertical holes into the dam and filling them with dynamite to use blast shock wave to compress and plug the leaks. As the flow speed of 1.67 m would wash away any clay, the blast technique was adopted and the result was satisfactory.

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